

# Work Order ID 74658

Wednesday, October 05, 2011 7:49:46 AM



# U/R

Page 1

Item ID: D350-748-101

Revision ID: U/R

Item Name: Crosstube Installation, High Fwd

Start Date: 10/5/2011 Start Qty: 1.00

Required Date: 10/28/2011 Req'd Qty: 1.00

Reference:

Approvals: Process Plan:

QC:

Date:

Date:

Tooling:

SPC (Y/N):

Date:

Date:

Run Start

Stop

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Tool ID Tool # Plan  
Code Accept Reject Reject Insp.  
Qty Qty Number Stamp

Draw Nbr

Revision Nbr

D350-748-141

F U/R

OK 11.11.04

100

0.00

DC

Document Control

DOCUMENT CONTROL

Memo

Photocopy bluefile & type labels per PPPD350-748-101 CHG002

110

0.00

CNC Bend 1

CNC Delta 100 Bender

BENDING MACHINE - CROSSTUBES

Memo

Bend tube as per Dwg D350-748-141 using CNC bender program D350F and Folio FT

120

0.00

QC

Quality Control

QC15- Crosstube Dimensional Check

Memo

0.00

11.11.04 (1)

11-10-5

11.10.05

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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Page 2

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Process Plan:

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Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Tool ID Tool # Plan Code Accept Qty Reject Qty Reject Number Insp. Stamp

125

0.00



HandFXtube

Memo

0.00

\*\*\*Stress relief\*\*\*

Heat treat crosstube as per QSI010 4.3

Temp: 325

Start time: 16h50

Finish time: 20h50

① SAD 11-18-05

127

QC6- Inspect dimensions to drawing

0.00



QC

Memo

0.00

Su110106

②

Quality Control

Dart Aerospace Ltd

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Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Tool ID

Tool #

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

130

0.00



Crosstubes

Crosstubes

Memo

0.00

1-Drill Tube as per Dwg D350-748-141 Using DT8876 A,B & C Drill Jigs,  
Set-up drill table as per QSI 010

2-Deburr

3-Engrave Part # and Batch # as per Dwg D350-748-141

4-Remove all marks from tube within limits of D350-748-141

5- Apply a light coat of LPS3 on the interior of tube

Batch: M109956

*Handwritten notes:*  
} 11-10-06  
JW 11-10-06

140

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

CHECK 10 DEG HOLES WITH DT8876E (EUROCOPTER CLAMP)

Quality Control

*Handwritten signature:* S. Ullrich

**Dart Aerospace Ltd**

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Page 4

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QC:

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Date:

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Tool ID

Tool #

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

150

Outsource process-Cadplate per QSI017 4.1.9.1

0.00



Outsource3

Memo

0.00

Outsource process - Cad plate

Issue P/O: 15117  
Stress relief at 375° for 5 hours  
Magnetic Particle Inspect per ASTM E1444  
Cadium Plate per AMS-QQ-P-416B, Class I, Type 2  
Embrittle relief at 375° for 8 hours, Chromate Treat  
Possible Supplier: Southwest United Industries  
Ensure Certificate of Conformity is attached

R11-10-11

160

Receive & Inspect for Damage & Mat'l Certs

0.00



Packaging

Memo

0.00

Packaging

Ensure certificate of conformity is attached

R11/11/01

170

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

★ SEE W/D CRG ATTACHED

POSITIVE RECALL

EFFECTIVE 11.10.03 AUTH gp

RELEASED 11.11.04 DATE gp

11-11-03

issue P/O to Accuren for NDT as per QSI 038

R.O. 15359

CLU/11/03

Rec'd + inspect + attached full report to W/O

R11/11/03

**Dart Aerospace Ltd**

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Dart Aerospace Ltd

W/O: 74658		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
11.10.05	161	LOAD TUBE TO 3500 <sup>lb</sup> FOR 1 MINUTE.  REF D.S. EMAIL.  3N 74658	GP	11.11.01	1	GP 11.11.01 B1042	MW 11/11/02	
11.10.05	162	NDT TUBE.				GP 11.11.01 B1042	MW 11/11/02	

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## Chris Provencal

---

**From:** David Shepherd <dshepherd@dartaero.com>  
**Sent:** Tuesday, April 27, 2010 3:40 PM  
**To:** 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com  
**Subject:** 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.

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Page 5

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Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180  SprayPaint Spray Painting	SprayPaint  Memo 1-Prime inside crosstube as per QSI 005 4.2 2-Prime Outside of Tube as per Dart QSI 005 4.2	0.00  0.00						85 11-11-03	
190  QC Quality Control	QC14- Inspect Spray Paint  Memo Then, Wrap in plastic bag to protect from scratches	0.00  0.00						m 11-11-04 (1)	
200  Crosstubes Crosstubes	Crosstubes  Memo 1-Install Ground wire Insert, then insert screw and washer 2-Install Abraison strips as per Dwg D350-748-141 & QSI 035. 3-Install supports Using Dt8876 as per Dwg D350-748-141. Torque to 60-80 IN-LBS	0.00  0.00						85 11-11-04	

**Dart Aerospace Ltd**

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Page 6

Wednesday, October 05, 2011 7:49:46 AM

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Required Date: 10/28/2011 Req'd Qty: 1.00



Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

210

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

Mf 11-11-04 ①

220

Pick Kit

0.00



Packaging

Memo

0.00

Packaging

SP 11-11-04.

230

QC4- 100% Inspect kits for completeness

0.00



QC

Memo

0.00

Quality Control

Mf 11-11-04 ①

**Dart Aerospace Ltd**

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Wednesday, October 05, 2011 7:49:46 AM



Page 7

Item ID: D350-748-101

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Revision ID: U/R

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Item Name: Crosstube Installation, High Fwd

Start Date: 10/5/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 10/28/2011 Req'd Qty: 1.00



Customer:

Reference:

Run Start



Approvals: Process Plan: Date: Tooling: Date:

Stop



QC: Date: SPC (Y/N): Date:

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240	Packaging	0.00							
	Packaging								
	Memo	0.00							
	Identify and pack for shipping as per PPP D350-748-101								
	Location: _____								
	PPP Rev: _____								
250	QC21- Final Inspection - Work Order Release	0.00							
	QC								
	Memo	0.00							
	Quality Control								

*Perkins*

*CK u/11/04*

*MF*  
*11-11-04*

**Dart Aerospace Ltd**

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# Picklist Print

Wednesday, October 05, 2011 7:49:42 AM

Page 1

Work Order ID: 74658

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd



Start Date: 10/5/2011

Required Date: 10/28/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 06-07-05 JLM  
 IPP Rev:B Update qty of MS21042L5 06-09-12 KJ  
 IPP Rev:C Rev B 07-11-15 DD  
 IPP Rev D Combined manufacturing 08.04.02 EC verified by: DD  
 IPP Rev:E 08-06-24 revD as per dwg DD verified by:EC IPP Rev:F  
 10.08.04 added QSI010 4.3 DD verf:EC

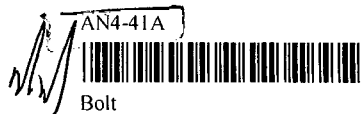
Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
ALS4-1032-225		Purchased	No			200	Each	1,852.000	1	1			
<div> </div> <div> 118696 </div> <div> </div> <div> 85 </div> <div> 11-11-04 </div>													
Insert													

Location	Loc Qty	Loc Code
ST282	1852	
110768	62	
118386	860	
118966	930	

Purchased	No		220	Each	309.0000	8	8
-----------	----	--	-----	------	----------	---	---

Location	Loc Qty	Loc Code
ST360	309	
115108	34	
115705	50	
116191	50	
117619	50	
117795	25	
118451	50	
118838	50	

SP 11-11-04.



Bolt

x1

**Dart Aerospace Ltd**

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Page 2

*5*

Start Date: 10/5/2011

Required Date: 10/28/2011

Start Qty: 1.00

Required Qty: 1.00



Purchased

No

220

Each

6,236.000



16

*80*

## Location

## Loc Qty

## Loc Code

ST356

1230

117872

30

118422

300

118628

400

118838

300

119127

200

ST358

6

117514

6

ST516

5000

119017

5000



Purchased

No

220

Each

183.0000



4

*80 11-11-04*

## Location

## Loc Qty

## Loc Code

ST339

75

118628

50

118983

25

ST340

108

117872

58

118422

50

*4x*

AN960JD10

NAS1149D0363J

Purchased

No

200

Each

0.0000



1

*118612 2x 11-11-04*

*m 119097-8P11-11-04*

Washer

AN960JD416

NAS1149D0463J

Purchased

No

220

Each

0.0000



32

Washer

Wednesday, October 05, 2011 7:49:43 AM

Shop Packet Print

Page 2

**Dart Aerospace Ltd**

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Page 3

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Required Date: 10/28/2011

Start Qty: 1.00

Required Qty: 1.00

AN960JD516 NAS1149D0563J Purchased No

220 Each

0.0000

8

8



Washer

D2856-400 Manufactured No

200

f

373.3845

1.181

1.243158



Abraison Strip

## Location

## Loc Qty

## Loc Code

ST403

0.3149

68076

0.3149

ST409

373.0696

63735

0.6696

71164

156.4

73491

216

D3500-1 Manufactured No

220

Each

28.0000

4

4

D3500-1



Saddle

## Location

## Loc Qty

## Loc Code

ST424

21

66127

9

68947

12

ST424/25

7

62207

7

D3501-1 Manufactured No

220

Each

245.0000

16

16

D3501-1



Bushing

## Location

## Loc Qty

## Loc Code

ST063

202

68939

102

70682

100

ST066

43

67757

43

Wednesday, October 05, 2011 7:49:43 AM

Shop Packet Print

Page 3

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Page 4

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Start Date: 10/5/2011

Required Date: 10/28/2011

Start Qty: 1.00

Required Qty: 1.00

D3502-1 Manufactured No

200

Each

63.0000

2

2



Support

## Location

## Loc Qty

## Loc Code

ST063

63

61206

7

64004

10

68951

12

72129

14

73419

20

D350-748-141TRN

Manufactured No

110

Each

3.0000

1

1



Crosstube Turning Detail

## Location

## Loc Qty

## Loc Code

LG

3

72812

1

72815

1

72817

1

MS21042L4

Purchased

No

220

Each

14,709.00

24

24



Nut

## Location

## Loc Qty

## Loc Code

ST300

3709

117441

51

117601

637

117885

21

118451

2000

118927

1000

ST516

6000

119017

6000

ST518

5000

119075

5000

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Shop Packet Print

Page 4

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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

**Part No:** \_\_\_\_\_ **PAR #:** \_\_\_\_\_ **Fault Category:** \_\_\_\_\_ **NCR:** Yes No **DQA:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
**Resolution:** \_\_\_\_\_ **Disposition:** \_\_\_\_\_ **QA: N/C Closed:** \_\_\_\_\_ **Date:** \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



# Picklist Print

Wednesday, October 05, 2011 7:49:43 AM

Page 5

Work Order ID: 74658

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 10/5/2011

Required Date: 10/28/2011

Start Qty: 1.00

Required Qty: 1.00

MS21042L5

Purchased

No

220

Each

2,684.000

4

4

Nut

## Location

## Loc Qty

## Loc Code

ST300

1184

116105

5

116548

53

117441

248

117611

82

118179

496

118910

300

ST518

1500

119109

1500

MS21920-20

Purchased

No

200

Each

62.0000

2

2

Clamp (per MIL-DTL-8783C)

## Location

## Loc Qty

## Loc Code

LG050

62

116799

10

118236

6

118649

46

MS27039-1-10

Purchased

No

200

Each

215.0000

1

1

Screw

## Location

## Loc Qty

## Loc Code

ST290

15

117441

15

ST291

200

118612

200

Wednesday, October 05, 2011 7:49:43 AM

Shop Packet Print

Page 5

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

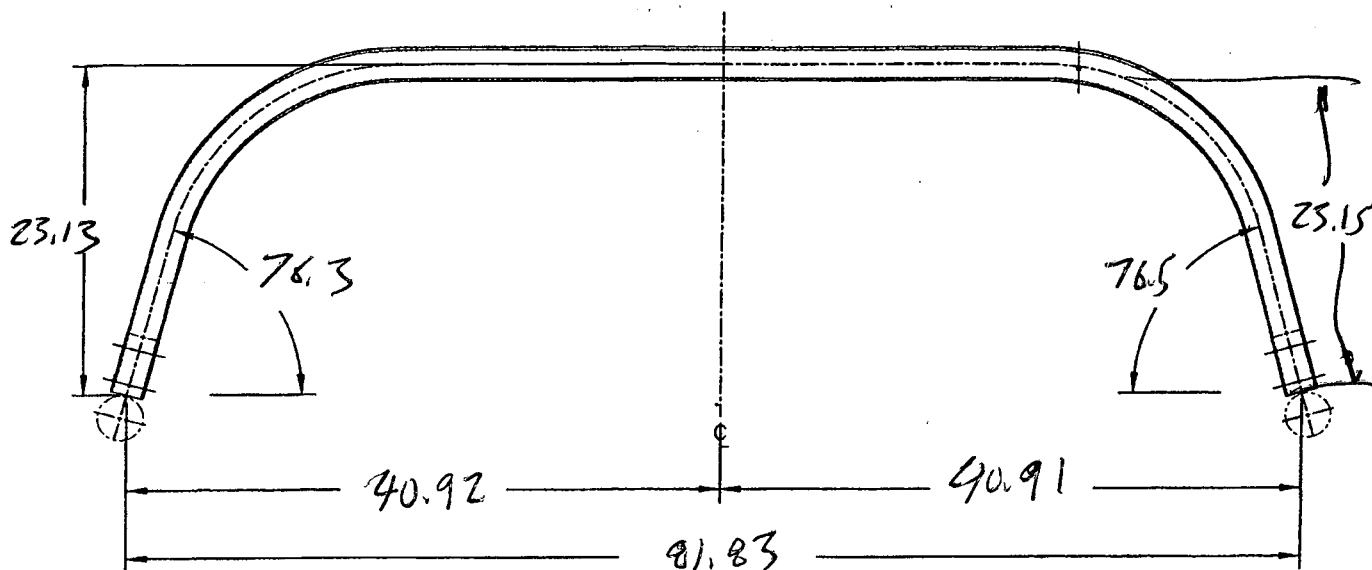
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

DART AEROSPACE LTD		Work Order:	74658
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141	Rev: E	Page 1 of 1	

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



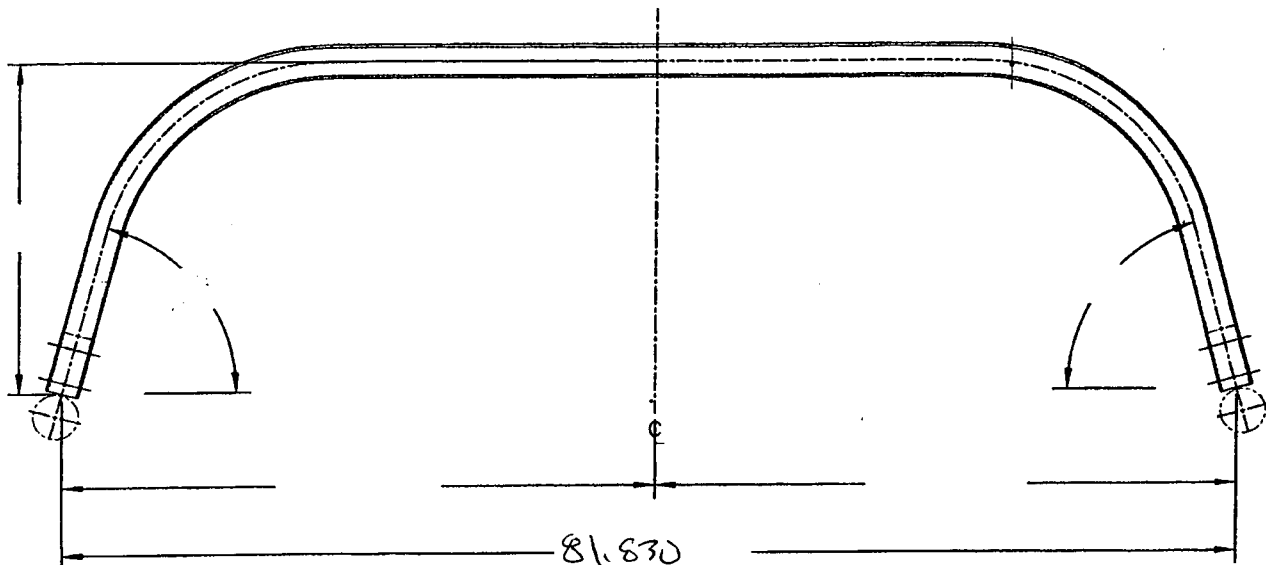
Comments
Crushing: $2.077 - 2.318 = 5.5\%$
$2.072 - 2.314 = 5.5\%$
Twist: $0.004"$ #Passes 39/40

QC15 Inspection	11.10.05
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b>	
<b>Description:</b> Crosstube High Fwd (AS350/355)		<b>Part Number:</b>	<b>D350-748-101</b>
<b>Inspection Dwg:</b> D350-748-141 <b>Rev:</b> E			<b>Page 1 of 1</b>

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
twist = 0.020"

QC15 Inspection	<i>S</i>
Date	11/10/06

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	<i>[Signature]</i> 10.08.23



## Kim Johnston

---

**From:** Chris Provencal <cprovencal@dartaero.com>  
**Sent:** Wednesday, October 05, 2011 10:07 AM  
**To:** Johnston, Kim  
**Subject:** FW: 350 crosstubes

Can you print this.

**From:** David Shepherd [mailto:dshepherd@dartaero.com]  
**Sent:** Tuesday, April 27, 2010 3:40 PM  
**To:** 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com  
**Subject:** 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.



Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115  
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO  
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO  
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,  
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE  
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,  
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.  
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE  
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO  
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT  
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN  
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

UNDER REVIEW

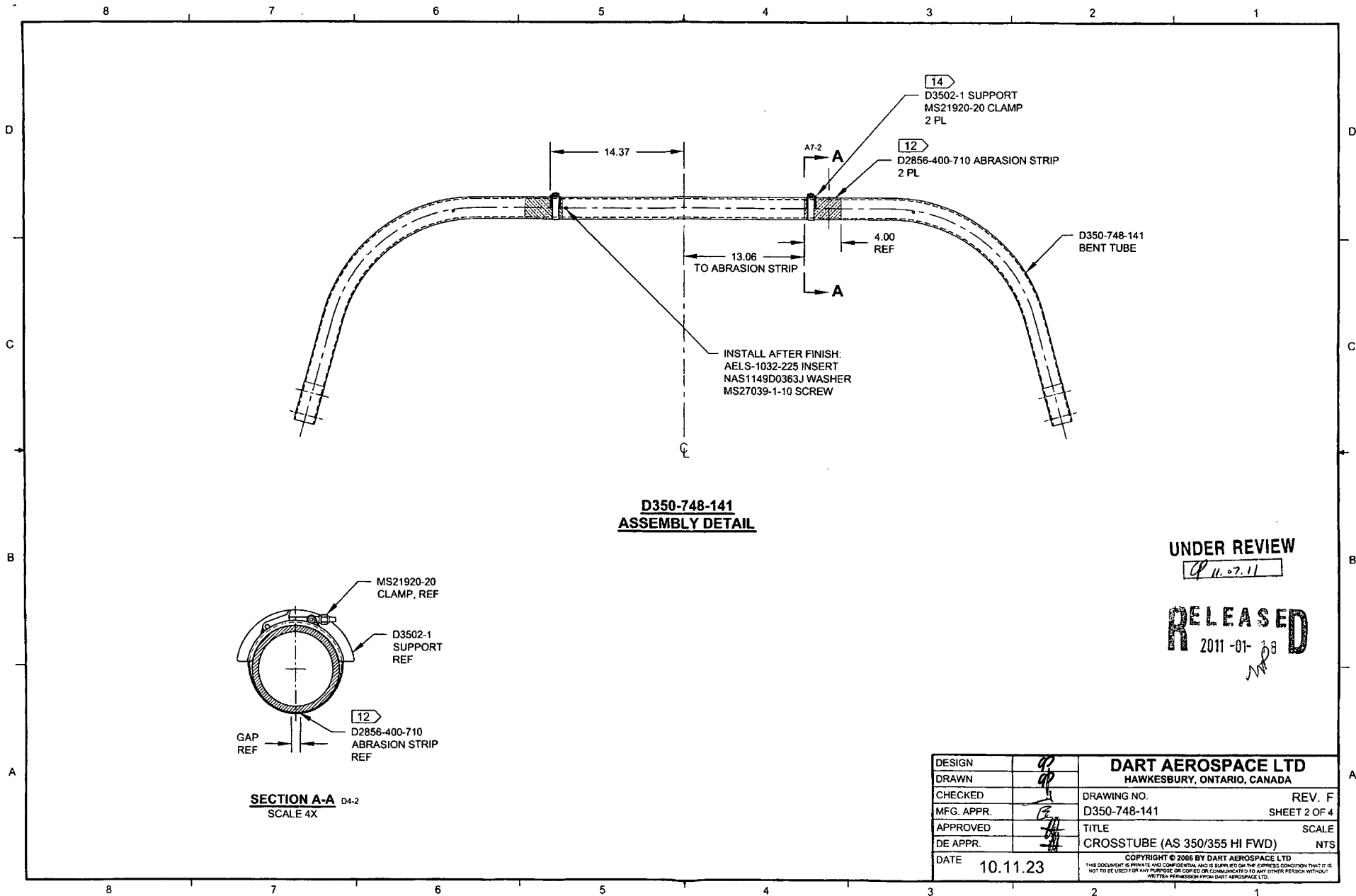
11.07.12

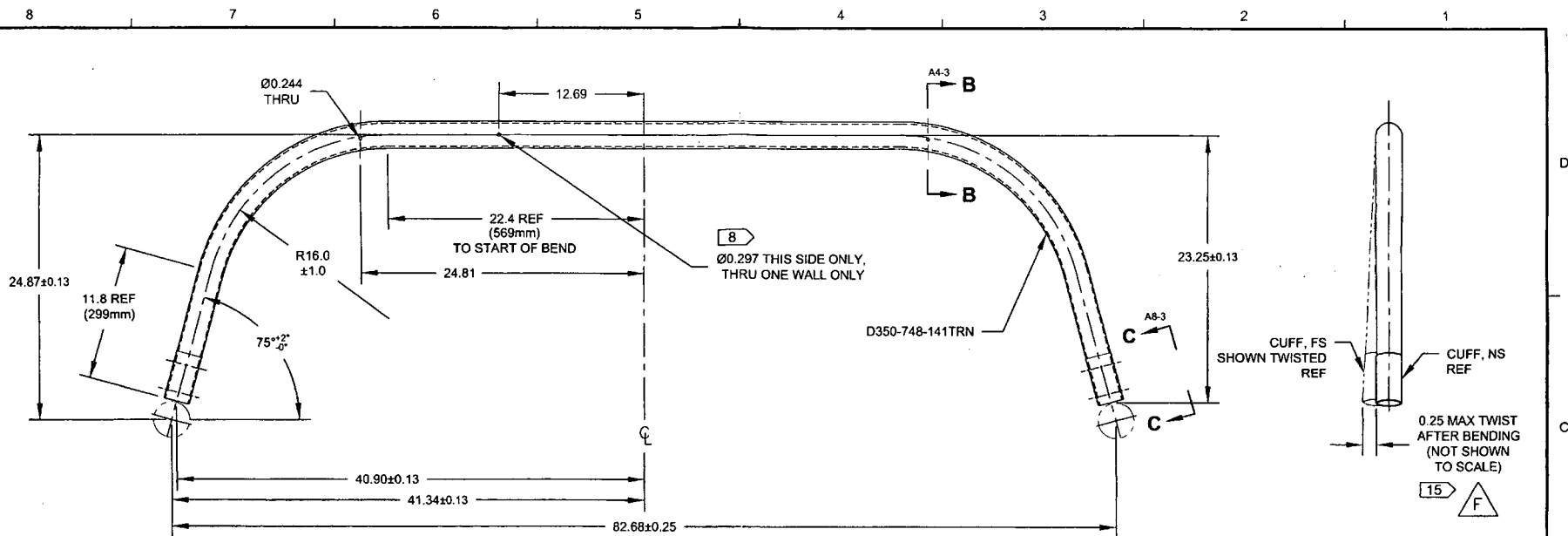
RELEASED  
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C8-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	10.11.23		

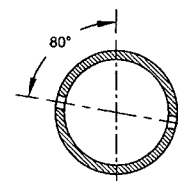
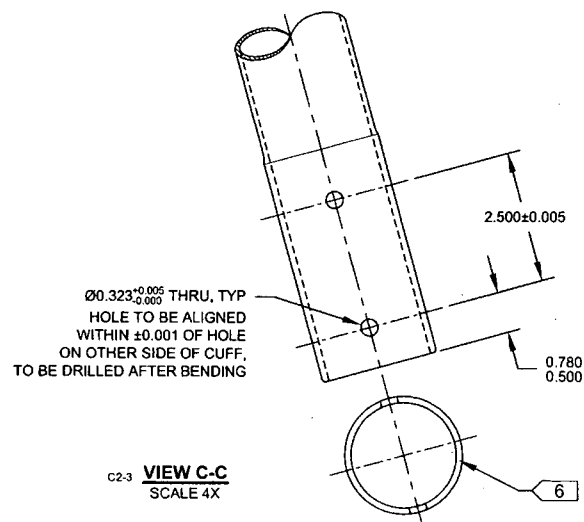
<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
DRAWING NO. D350-748-141	REV. F SHEET 1 OF 4
TITLE CROSSTUBE (AS 350/355 HI FWD)	SCALE NTS
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**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10

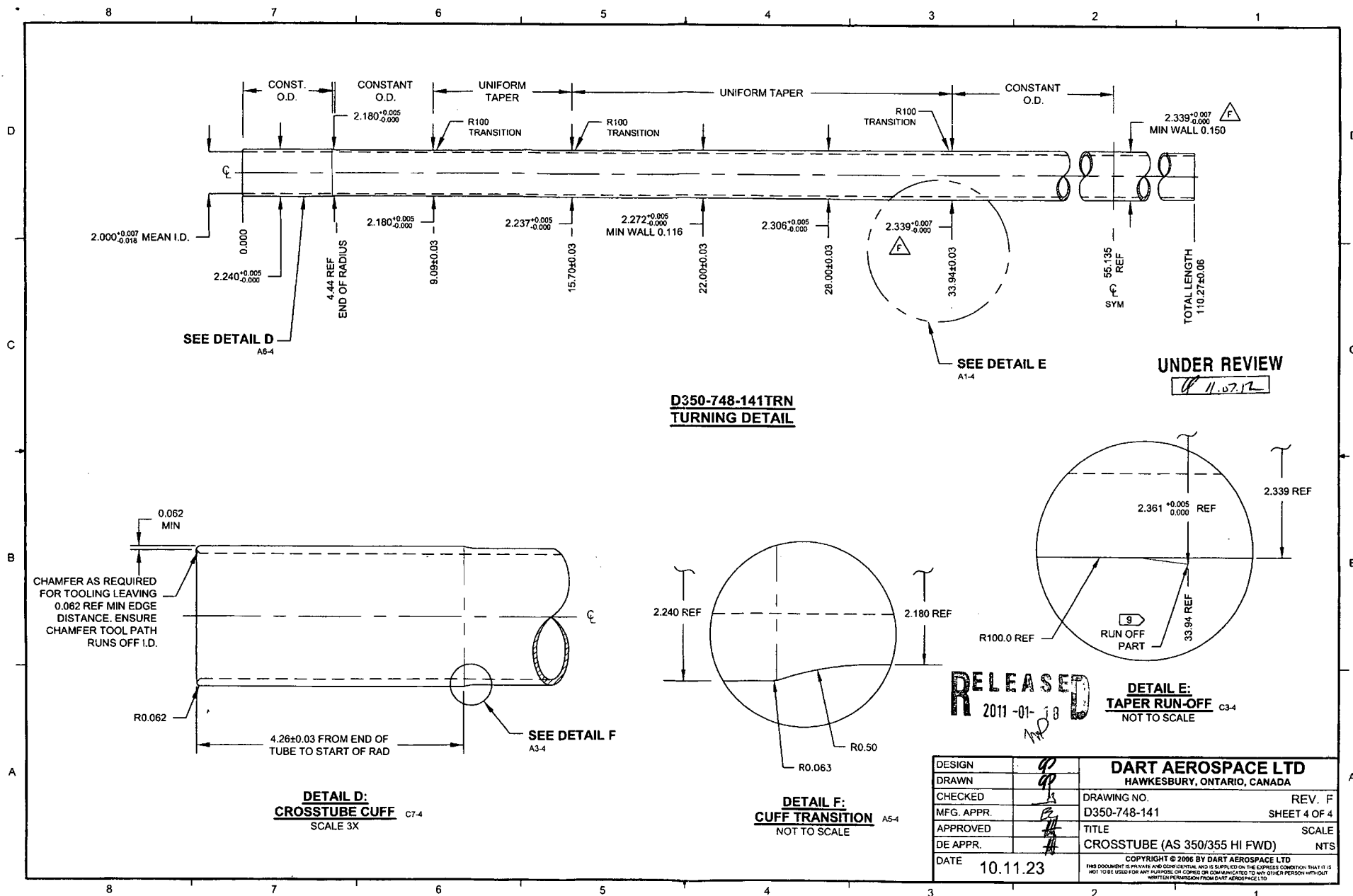


UNDER REVIEW

11.27.12

RELEASED  
 2011-01-18

DESIGN	qp	<b>DART AEROSPACE LTD</b>	
DRAWN	qp	HAWKESBURY, ONTARIO, CANADA	
CHECKED	h	DRAWING NO.	REV. F
MFG. APPR.	h	D350-748-141	SHEET 3 OF 4
APPROVED	h	TITLE	SCALE
DE APPR.	h	CROSSTUBE (AS 350/355 HI FWD)	NTS
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DESIGN	40	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
DRAWN	40		
CHECKED	1	DRAWING NO.	REV. F
MFG. APPR.	1	D350-748-141	SHEET 4 OF 4
APPROVED	1	TITLE	SCALE
DE APPR.	1	CROSSTUBE (AS 350/355 HI FWD)	NTS
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## 5.0 PARTS LIST

Qty -101	Qty -201	Part Number	Description
X		D350-748-101	CROSSTUBE INSTALLATION, AS 350/355 HIGH FWD
	X	D350-748-201	CROSSTUBE INSTALLATION, AS 350/355 HIGH AFT
1		D350-748-141	CROSSTUBE ASSEMBLY, AS 350/355 HIGH FWD
	1	D350-748-241	CROSSTUBE ASSEMBLY, AS 350/355 HIGH AFT
*2	*2	D3502-1	SUPPORT
*2	*2	D2856-400-710	ABRASION STRIP
*1	*1	AELS-1032-225	INSERT
*2	*2	MS21920-20	CLAMP
*1	*1	MS27039-1-10	SCREW
*1	*1	AN960JD10	WASHER
4	4	D3500-1	SADDLE
16	16	D3501-1	BUSHING
16	16	AN4-6A	BOLT
8	8	AN4-41A	BOLT
4	4	AN5-32A	BOLT
32	32	AN960JD416	WASHER
8	8	AN960JD516	WASHER
24	24	MS21042L4	NUT (OR MS21042-4)
4	4	MS21042L5	NUT (OR MS21042-5)

\* REFERENCE ONLY. PARTS ARE INCLUDED IN D350-748-141/241 ASSEMBLIES ABOVE

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Revision: B

Date: 07.06.15

**CERTIFICATE OF  
CONFORMANCE**

**CADORATH PLATING CO. LTD.  
2150 LOGAN AVENUE  
WINNIPEG, MANITOBA R2J-0J1**

**DATE:** Oct-28-2011

**CONSIGNED TO:** Dart Aerospace Ltd.  
1270 Aberdeen St.  
Hawksbury, ON K6A 1K7

**W/O #:** 108676  
**INVOICE #:** 57422

**CONTRACT OR  
PURCHASE ORDER #** 15117

**DESCRIPTION:** SKID **QTY** 1

**P/N #** d350-748-101

**S/N #** B74658

STRESS RELIEF @ 375 DEG. 5 HRS BAKE HEAT CHART # 11-1084.  
MPI INSPECTED IAW ASTM-E-1444. CADMIUM PLATED IAW AMS-  
QQ-P-416C, TYPE 2 YELLOW, CLASS 1. HYDROGEN  
EMBRITTLEMENT @ 375 DEG. 8 HRS. BAKE HEAT CHART #11-1095.

**CERTIFICATE:** I certify that the items indicated here on have  
been inspected and tested and conform to all specifications  
and requirements detailed on the contract or purchase order.

**Approved Inspector:**



A large, stylized handwritten signature in black ink.



## RAPPORT D'INSPECTION PAR RESSUAGE

P-11134

NT

INTION

ESSE

JET

(S) EXAMINÉ

DATE

N° TRAVAIL  
ACUREN

N° CLIENT POWO

SITE DE TRAVAIL

ACCEPTATION STD.

PAGE

HEURE

AM

PM

1 DE 2

3 novembre 2011  
188-11-02386

Dart Usine

ASTM 1413/OS1038 DATE/RÉV. 2005

Cross tubes inspection (Fluorescent Penetrant)  
12 x cross tubes (5x Steel, 7x Aluminium)

## DESCRIPTION DES TRAVAUX

N° PROCÉDURE

LT-002

DATE/RÉV.

2007

N° TECHNIQUE

LT-002

DATE/RÉV.

2007

REMS See other sheet

MATÉRIEL

Steel - Aluminium

ÉPAISSEUR

RIPTION

Inspection 100% Fluorescent on surface external  
on 12 x cross tubes.

## DÉTAILS DES INSPECTIONS

MODE :

☒ FLUORESCENT☐ VISIBLE☒ LAVABLE À L'EAU☐ MÉTHODE DISSOLVANT☐ PRÉ-ÉMULSIONNANT

QUE :

Magnaflux

LUM. NOIRE S/N

16440

☐ PUISS. > 1000 µ W/CM²☐ AMBIANT < 2 fc

ÉTRANT :

Zigzag ZL67

TEMPS PÉNÉTRATION MIN.

10

MIN.

ÉQUIP. LUMIÈRE

☐ LAMP. POCHÉ☐ LAMP. CULASSE☐ PUISS. > 100 fc @ SURFACE

OLVANT PÉNÉTRANT

H2O

TEMPS SÉCHAGE MIN.

&gt;10

MIN.

AUTRES

Machete Labino

ILATEUR

SKD S2

TEMPS PÉNÉTRATION MIN.

10

MIN.

MÈTRE LUM. N/S

DATE CAL DUE

RÉVÉLATEUR

☒ NON AQUEUX☐ AQUEUX☐ SEC

## SURFACE INSPECTÉE

DITION SURFACE

☐ MEULÉE☐ SOUDÉE☐ MACHINÉE☐ GRENAILLÉE☒ MÉTAL PROPRE

PÉRATURE SURFACE

☐ < - 4°C/ 20°F☐ - 4°C/ 20°F DE 10°C/50°F☒ 10°C/50°F DE 52°C/125°F☐ > 52°C/125°F

## UNITÉS-

☐ MÉTRIQUE☐ IMPÉRIALSee other sheet  
For Results

## Notice des Services

Le présent rapport est émis selon la politique du Groupe Acuren Inc. qui est d'exécuter les services demandés par le client. Il est entendu que toutes les observations, les observations et les expressions d'opinions faites par Acuren reflètent les opinions ou les observations de l'entreprise fondées sur l'information et les hypothèses fournies par le propriétaire/opérateur, et elles ne constituent pas des déclarations ou des garanties ou ne peuvent être interprétées comme constituant. Le Groupe Acuren Inc. n'assume aucune des responsabilités du propriétaire/opérateur, et le propriétaire/opérateur conserve la responsabilité des décisions prises en matière d'ingénierie, de fabrication, de réparation et d'usage à partir de l'information ou des données fournies par Acuren en rapport avec les services décrits dans les présentes ne peuvent excéder le coût des services rendus.

## Niveau de Diligence

Le Groupe Acuren Inc. applique le degré de diligence, le soin et la compétence normalement exercés dans des circonstances semblables par d'autres fournisseurs de ce type de services opérant dans la même région ou dans une localité similaire. Aucune autre garantie, implicite ou explicite, n'est faite ou voulue par le Groupe Acuren Inc.

## NATURES

PRÉSENTANT

TECHNICIEN (SIGNATURE)

1<sup>ER</sup> (MOULÉ):

ONGC NIVEAU

2

SNT NIVEAU

ONGC NIVEAU

SNT NIVEAU

ONGC N° REG.

18205

ONGC N° REG.

FTJ #

RAPPORT  
RÉVISÉ PAR:

NOM

INITIALES



## RAPPORT D'ESSAI NON DESTRUCTIF

(SUITE)

RAPPORT #

P 11134

PAGE 2 DE 2

CLIENT DART AEROSPACE DATE 2 novembre 2011 HEURE 8 AM ☐ PM  
ATTENTION Mme Linda Lucelle NO. TRAVAIL ACUREN 188-11-02386  
RÉSULTATS ☐ METRIQUE ☐ IMPÉRIAL

STEEL Crosstubes:

Work order ID 66922 Item ID D350-748-101  
" " " 74646 " " " " "  
" " " 66921 " " " " "  
" " " 66924 " " " " "  
" " " 74658 " " " " "

Aluminium Crosstubes:

Work order ID 75603 Item ID D 212-664-101  
" " " 75604 " " " " "  
" " " 75800 " " D 212-664-207  
" " " 75801 " " " " "  
" " " 75985 " " D 212-664-201  
" " " 75417 " " D 412-664-203  
" " " 75416 " " " " "

- All the Crosstubes (12) Accepted
- No linear indication as found

11/11/03

## Étendue des Services

L'entente selon laquelle le Groupe Acuren Inc. exécute les services ne concerne que les énoncés par écrit. En aucune circonstance ces services ne s'étendent au-delà de l'exécution des services demandés. Il est entendu que toutes les descriptions, les observations et les expressions d'opinions faites par Acuren reflètent les opinions ou les observations de l'entreprise fondées sur l'information et les hypothèses fournies par le propriétaire/opérateur, et elles ne constituent pas des déclarations ou des garanties ou ne peuvent être interprétées comme constituant. Le Groupe Acuren Inc. n'assume aucune des responsabilités du propriétaire/opérateur, et le propriétaire/opérateur conserve la responsabilité entière des décisions prises en matière d'ingénierie, de fabrication, de réparation et d'usage à partir de l'information ou des données fournies par Acuren en rapport avec les services décrits dans les présentes ne peuvent excéder le coût des services rendus.

## Norme de Diligence

Dans l'exécution des services, le Groupe Acuren Inc. applique le degré de diligence, le soin et la compétence normalement exercés dans des circonstances semblables par d'autres fournisseurs de ce type de services opérant dans la même localité ou dans une localité similaire. Aucune autre garantie, implicite ou explicite, n'est faite ou voulue par le Groupe Acuren Inc.

## SIGNATURES

REPRÉSENTANT  
À LA CLIENTÈLE

TECHNICIEN (SIGNATURE)

NAME (MOULÉE):

NIVEAU CGSB

No. ENREG. CGSB

NIVEAU SNT

12205

NIVEAU CGSB

No. ENREG. CGSB

2<sup>e</sup> TECHNICIEN

NIVEAU SNT

FTJ #:

RAPPORT  
REVISÉ PAR:

NOM

INITIALES